Proceedings of the Iowa Academy of Science

Volume 5 | Annual Issue Article 15

1897

The Weathered Zone (Yarmouth) between the Illinoian and Kansan Till Sheets

Frank Leverett

THE WEATHERED ZONE (YARMOUTH) BETWEEN THE ILLINOIAN AND KANSAN TILL SHEETS.

BY FRANK LEVERETT, DENMARK, IOWA.

PRELIMINARY STATEMENT.

The full extent of overlap of the Illinoian upon the Kansan has not been determined. It is certain that a sheet of Kansan drift underlies the Illinoian throughout its extent in southeastern Iowa and in all probability it continues some distance eastward into western Illinois in the section between Rock Island and Quincy.

There may be a sheet of Kansan age formed by the Illinois glacial lobe. The available data, however, do not place this beyond question. Occasional wells in central Illinois are reported to have passed through a black soil at some distance below the Illinoian till. But so far as the writer is aware no exposures of such a soil have ever been discovered. Professor Salisbury has collected data in southeastern Illinois and southwestern Indiana which support the view that there may be two distinct drift sheets in that region. It is his opinion that the upper or Illinoian sheet extends farther south than the lower sheet (1). Whether the lower sheet is of Kansan age is still a matter for conjecture. It also is still an open question whether the drift on the east border of the driftless area in northwestern Illinois and southwestern Wisconsin is of Illinoian age or of earlier date. In view of these uncertainties the Yarmouth weathered zone is restricted in this discussion to the region where the Illinoian sheet of the Illinois lobe overlaps the Kansan sheet of an ice lobe lying farther west.

Numerous exposures of a soil and weathered zone have been observed at the junction of the Illinoian and the Kansan till

(1) Communciated to the writer.

sheets in the region of overlap between Davenport, Iowa and Quincy, Ill. The presence of this soil horizon was first brought to the writer's notice by a well section at Yarmouth in Des Moines county, Iowa. For this reason, and because the name of this village is less likely to be confusing than names which are common, it seems appropriate to apply the name Yarmouth to this weathered zone. There is also at Yarmouth not only a soil horizon but apparently a pronounced erosion between the Illinoian and Kansan sheets.

THE YARMOUTH SECTIONS.

About ten years ago Mr. William Stelter of Yarmouth, Iowa, sunk a well near that village which passed through a bed of peat at the base of the Illinoian till sheet. The peat contained small bones which have been identified by Dr. F. W. True, of the United States National museum, as: (1) a portion of the pelvis and upper part of the femur of the wood rabbit (*Lepus sylvaticus*); and (2) the scapula of the common skunk (*Mephiticus mephitica*). The following section was furnished by Mr. Stelter soon after the well was dug, and specimens of the several classes of material penetrated were also furnished me for examination:

	FEET.
Soil and loess loam	4
Yellow till (Illinoian)	20
Gray till (Illinoian)	10
Peat bed with twigs and bones	15
Gray or ashy clay containing fragments of wood	12
Fine sand	16
Yellow sandy clay with few pebbles (Kansan)	33
Total depth	110

One mile south of Yarmouth, on the farm of Mr. F. Smith, a well was in process of excavation during a visit made by the writer to that region some years later, and the following section was determined by examination of the material in the dump, and by explanations by the well borer. The well is located on a high point of the ridge marking the border of the Illinoian drift, perhaps twenty-five feet higher than the village of Yarmouth, which also stands on the ridge. It will be observed that the black muck penetrated in this well is at a level fully forty feet lower than in the well at Mr. Stelter's. This difference in level is interpreted to be due to one well having

struck into a valley cut into the Kansan drift, while the other well entered the Kansan drift near the level of the bordering uplands:

SECTION OF WELL AT F. SMITH'S, NEAR YARMOUTH.

	FEET.
Yellow till (Illinoian)	36
Sand with thin beds of blue clay and also of cemented gravel	73
Black muck containing wood	6
Sand and gravel, probably alluvial	8
Gray silt nearly pebbleless, apparently alluvial	15
Blue till (Kansan)	42
Total depth	180

If my interpretation of the records at Yarmouth is correct there is here not only a notable accumulation of peat and muck between the Kansan and Illinoian, but also an erosion of the Kansan till sheet to a depth of forty feet prior to the deposition of the Illinoian. Since these sections are based entirely upon well records they afford a less clear idea of the relation of the beds than might be afforded by valley excavation.

EXPOSURES IN NEIGHBORING DISTRICTS.

One of the most satisfactory exposures yet found is that afforded by a ravine about one mile northeast of West Point, in Lee county. This was first seen by the writer in 1894. The following section may be obtained by descending the gully at the roadside:

	FEET.
Surface silt (loess)	6
Black soil with ashy gray subsoil	5
Brown till containing many bowlders, among which were two red jaspery conglomerates (Illinoian)	15
Black mucky soil with gray subsoil (Yarmouth)	6
Brown clay with few pebbles (Kansan)	15
Total	47

This exposure was visited by Prof. T. C. Chamberlin and Dr. H. F. Bain in August, 1896, and by each the black material beneath the till was considered a typical soil, and the gray material below a typical subsoil. The slightly pebbly brown clay beneath this subsoil shows no response with acid. Other exposures, however, have been found in which a response with

acid may be obtained within six feet below the base of the lower or Yarmouth soil.

Between West Point and Denmark, a distance of seven miles, records of thirteen wells have been obtained in which a soil was found between the Illinoian and Kansan till sheets. The thickness of the soil ranges from 2 to 5 feet and its depth below the surface ranges from 16 feet to 45 feet; the usual distance to the soil is about 30 feet. This represents, therefore, the combined thickness of the Iowan loess and Illinoian till sheet. The loess, however, has a depth of but 5 to 10 feet. Of several wells made at Denmark in 1894 to 1897 the writer has witnessed the excavation, and finds that the leaching beneath the lower soil extends about six feet into the Kansan till sheet. One of the most satisfactory sections near Denmark is the following, made on the farm of Mrs. Van Tuyl:

	FEET.
Surface silt or loess of yellow color, slightly calcareous and containing a few small pebbles near base.	7
Brownish yellow till, slightly calcareous and with few pebbles (Illinoian).	10
Brownish yellow till very pebbly and calcareous (Illinoian)	8
Blue clay with few pebbles (Illinoian).	10
Black mucky soil with wood (Yarmouth).	2
Brownish-yellow till (Kansan)	12
Hard blue till (Kansan)	6
Limestone	4
Total	59

In this connection it may be remarked that several of the wells in the vicinity of Denmark pass through 25 or 30 feet of oxidized Kansan till and enter rock without striking a blue till, but exposures in ravines both north and south of the village show a dark blue-black till thickly set with fragments of wood. This occurs at a level lower than the rock surface at Denmark and has a striking similarity to exposures in other parts of the state, which are suspected to be pre-Kansan in age.

EXPOSURES AT DAVENPORT, IOWA.

The Illinoian till sheet as above noted is known to overlap the Kansan as far north as Davenport, Iowa. There are excellent exposures of both sheets within the limits of that city and also at points a few miles west, near Blue Grass. An exposure in Davenport, on Eighth street, between Myrtle and Vine, was

discovered by Prof. J. A. Udden, and has been visited by Professor Calvin, Dr. Bain and the writer, each of whom recognize the presence of both sheets of drift, and also the Yarmouth weathered zone. The surface of the Kansan till sheet has the appearance of slight erosion, for it shows a rise of about fifteen feet in a distance of twenty or thirty rods. The Illinoian till sheet rests uncomformably upon the eroded Kansan, reaching a lower level at the south end of the exposure than at the north. In making the descent along Eighth street the following series of beds was found:

	FEET.
Loess	30
Weathered zone of reddish-brown till (Sangamon).	3
Unleached brown till (Illinoisan)	15
Weathered zone of gummy, gray clay (Yarmouth).	3
Brown till changing to gray color at 12 to 15 feet (Kansan)	30

EXPOSURES IN ADAMS COUNTY, ILLINOIS.

The most southerly exposures of the Yarmouth weathered zone yet observed are in Adams county, Illinois. In a ravine in Woodville, in the northern part of the county, two sheets of brown till appear, which are separated by a gray, gummy clay. This clay is thoroughly leached while the till immediately above it is unleached. The latter has a thickness of only ten or twelve feet. Another exposure was found at a well in process of excavation on a farm eight miles east of Quincy. This section is similar to that in the ravine except that the Illinoian till sheet has a thickness of twenty feet. Another exposure was found north of Payson near the base of an Illinoian drift. The gray clay here rests upon a gravelly bed instead of a sheet of till, but appears to be of similar origin and age to the other beds referred to the Yarmouth stage.

Within a few miles south from this exposure the border of the Kansan drift emerges from the edge of the Illinoian, and passes southward into Missouri.

The driftless peninsula found by Professor Salisbury, here sets in and occupies a narrow strip west of the Illinois, from Pike county to the mouth of that stream,* beyond which the margins of the Illinoian and Kansan sheets take widely divergent courses. Fortunately there was sufficient overlap north from this driftless peninsula to make clear the interpretation

*See Proc. A. A. A. S., Washington meeting, 1891, pp. 251-253.

that the Illinoian is a markedly younger sheet than the Kansan. This difference in age was suspected to occur from a comparison of maturity of valleys in the two districts, but the testimony of the weathered zone preserved below the Illinoian was of value to confirm it.

THE AFTONIAN AND PRE-KANSAN DEPOSITS IN SOUTHWESTERN IOWA.

BY H. FOSTER BAIN.

INTRODUCTION.

The Aftonian deposits of southwestern Iowa have peculiar interest in that within the area is the type locality for the Aftonian. So far neither the drift of the region nor the Aftonian as a unit has received a general discussion. The references to the beds extant are merely incidental to broader studies. The type locality and several other critical exposures have been visited by many geologists but no one has presented a complete account of the beds in question. The time has not even yet arrived for an adequate discussion of the Aftonian, but in order to prevent possible misapprehensions it seems advisable to present a brief summary of present knowledge. It should be remembered that the exposures of the Aftonian and the sub-Aftonian are scattered; that their importance was unsuspected until quite recently; that in the nature of things the phenomena may be expected to be somewhat illusive, and that but little of the area has received detailed study. In view of these facts the present must be taken as a preliminary statement only and subject to considerable future revision.

Scattered evidence of a forest bed was found by White in his survey* of the region. The most noteworthy occurrence recorded by him was that of a peat bed two to three feet in thickness in Adair county.† There is some uncertainty, however, whether this peat occurs below the loess merely, or is beneath true bowlder clay, and hence, presumably of Aftonian age. A recent visit to the locality by Mr. Cowles, of the United States Geological Survey, failed to clear up the doubt on this point.‡

* Geol. Iowa, Vol. I, p. 97, 1870.
† Op Cit., p. 339.
‡ Private communication.